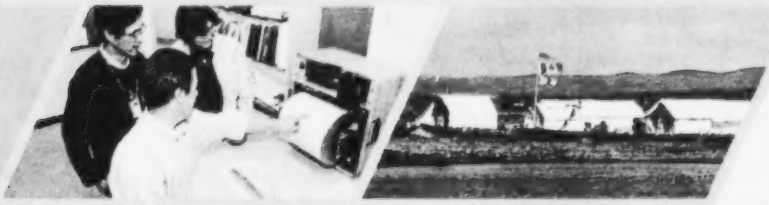
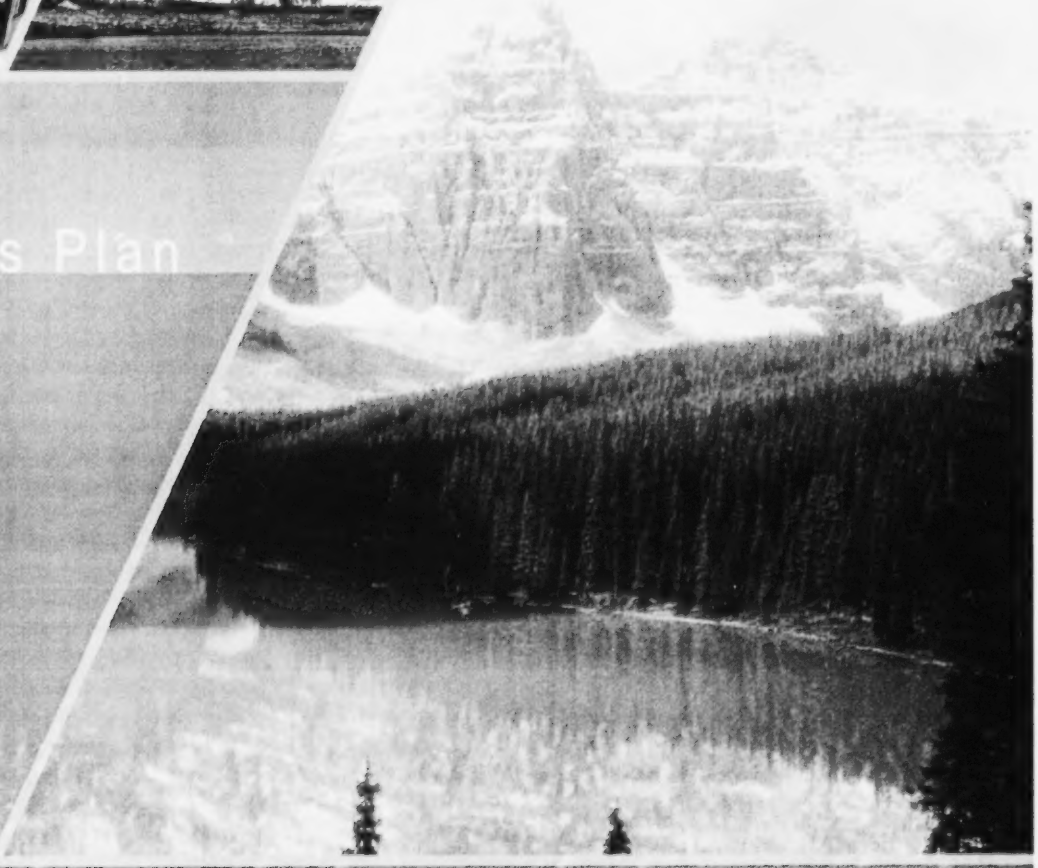
Natural Resources Canada
Ressources naturelles Canada

Earth Sciences Sector



# Business Plan
## 2006-2009



Canada

**Earth Sciences Sector Business Plan 2006-2009**

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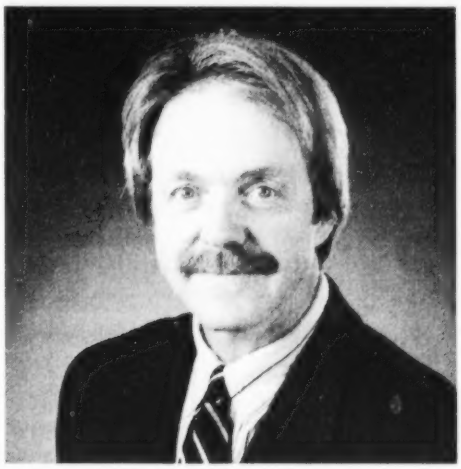
# Message from the Assistant Deputy Minister

The Earth Sciences Sector of Natural Resources Canada is a national institution with deep roots in Canada's history, some predating Confederation, and an equally important role to play in Canada's future. The Geological Survey of Canada, founded in 1842, was instrumental in opening the resource-rich lands of this country. Those who went before us helped to survey, map and plan the development of western Canada.

Technology has changed the way we operate. We have become a centre of expertise in remote sensing, and have moved our maps and basic land information to the digital and Internet world. The geoscience and geomatics we use have advanced remarkably. At the same time, technology has created new ways to understand our world, new issues and new expectations. Canadians expect more and different things from us than they did in the past.

The sector's scientific knowledge, tools and insights contribute to NRCan, to the Government of Canada, and to the lives of Canadians in four important ways:

- Economic development - to help Canadians find more mineral and fossil fuel resources, enhance the competitiveness of Canadian industry, and provide know-how and tools to increase Canada's economic opportunities in a changing world;
- Public safety and security - to help mitigate the risks due to natural hazards (such as earthquakes, landslides and magnetic storms), monitor nuclear test blasts and provide the maps and geo-information needed to help Canadians respond effectively to minimize the impacts of emergencies;
- Environmental stewardship - to understand and help protect our environment and critical resources like groundwater, to understand how these resources and their use are changing, and to provide information Canadians need to make decisions; and



- Supporting the governance and understanding of Canada - through the provision of a cadastral system, legal and geodetic surveys, topographic maps, the Atlas of Canada and the maintenance of place names and boundaries in Canada, all of which are essential to governing Canada and to understanding our geography and history.

Important progress has been made in making the sector a more flexible, horizontal organization and in ensuring that we adapt to a rapidly globalizing and changing world. Much of the credit for this progress goes to the ESS staff. A major part of our future will continue to be partnerships within NRCan, with other federal departments, and with our provincial and territorial colleagues. We need to fully tap into the expertise resident in our universities, community colleges and professional associations. Finally, we need to continue working closely with the private sector to ensure the relevance of our work to those who create jobs and wealth for Canadians.

Ours is one of the oldest programs in the Government of Canada. We have made it one of the most modern.

**Mark Corey**
Assistant Deputy Minister
Earth Sciences Sector

# 1. Introduction

**Natural Resources Canada (NRCan)** is the federal department responsible for ensuring the sustainable development of Canada's energy resources, minerals and metals, and forests. It also provides the geomatics and geoscience that inform decisions affecting Canada's land-based and offshore resources. In this way, the department contributes to the well-being of present and future generations of Canadians.

The **Earth Sciences Sector (ESS)** is the country's principal earth sciences agency. It provides timely, reliable information, services and expertise on geomatics and geoscience to Canadians. ESS is the foundation of Canada's earth sciences innovation system, recognized as a world leader in the provision of public-good earth sciences data and information.

The sector is made up of two major organizations: the **Geological Survey of Canada** and **Geomatics Canada**. As Canada's national geoscience agency, the Geological Survey of Canada provides geological information and technologies to support the sustainable development of Canada's resources. Geomatics Canada provides maps of, and geographic information on, Canada's landmass and offshore resources. The sector also manages several national initiatives, including **GeoConnections**, the **Climate Change Impacts and Adaptation Directorate** and the **Polar Continental Shelf Project**.

ESS supports the environmental, social and economic objectives of the federal government by focusing its portfolio of science and technology programs and services on innovative projects that improve the quality of life of Canadians. These activities—many of which cut across various sectors of the Canadian economy—are essential to Canada's economic, social and environmental prosperity. By providing enabling technologies and scientific research, the sector shares its knowledge and expertise in partnerships with clients, both at home and abroad.

# 2. Overview

## The Earth Sciences Sector Vision

The Earth Sciences Sector (ESS) will be a recognized leader in the development, deployment and integration of science and technology (S&T) into policy and decision-making by Natural Resources Canada (NRCan), the federal and provincial governments, industry and other stakeholders.

In 2002, on the basis of recommendations from the Committee of Science and Technology Advisors, ESS began to implement an innovative strategy to integrate S&T into policy and decision-making at NRCan. At that time, ESS ended all existing S&T activities and created a new program portfolio that was more clearly aligned with government objectives and funded for a three-year period from April 2003 to March 2006. Now, ESS has re-evaluated and rebalanced its entire portfolio of public-good activities, to bring it in line with current government priorities under the department's mandate. Accordingly, the sector has restructured much of what it does to clarify accountabilities for the achievement of its public policy objectives and it has reallocated resources to these new priority areas.

One measure of the sector's success in responding to government priorities is the significant funding for ESS initiatives since the realignment. In 2003, the federal budget allocated additional funding of $40 million to ESS over five years. In 2004, additional funding increased to $77 million over a five-year period. In 2005, funding rose again to $100 million. This 150-percent increase in funding over such a short time demonstrates the sector's effectiveness in understanding and responding to government objectives, and gaining public policy support. In other words, ESS is achieving its vision.

The 2006-2009 ESS Business Plan describes the various products and services that ESS will deliver during the planning period. It also shows clearly that the sector recognizes the vital importance of being a forward-looking organization, keenly aware of the environment in which it operates. This awareness ensures that ESS will have a positive impact on the public policy agenda and contributes to the sector's ability to provide

### Earth Sciences Sector Science and Technology Strategy:

- Have and maintain a highly motivated, innovative and focused staff.
- Maintain a balanced S&T portfolio.
- Do the right S&T at the right time.
- Own only what is necessary; influence all that you can.
- Use the best resources, wherever they exist, through the use of internal and external networks, partnerships and alliances.

the timely, authoritative geomatics and geoscience information necessary to improve the well-being of Canadians.

The sector's response to departmental priorities is delivered through a variety of vehicles:

- **programs:** S&T activities receiving three-year funding to produce public goods that achieve outcomes designed to contribute to current public policy objectives;
- **services to government:** delivery of public goods under an obligation to provide services to Canadians while contributing to public policy objectives;
- **transformative projects:** one-time projects to increase the value or decrease the costs of a service to government;
- **national initiatives:** programs managed by ESS on behalf of the government, generally under Memoranda to Cabinet approval or Cabinet instructions;
- **leadership:** activities that position ESS for success with clients, stakeholders and collaborators, regionally, nationally and internationally; and
- **people support:** projects devoted to, among other things, developing the human resource skills and competency base within ESS.

Geoscience and geomatics information has a wide range of applications, from emergency response to resource development. The generation and dissemination of new knowledge to contribute to the well-being of Canadians are at the forefront of all ESS activities. These activities require the sector to work closely with others within a vast network that extends throughout government, industry and academia. Key principles of the ESS S&T strategy are to "own only what is necessary; influence all that you can" and to "use the best resources, wherever they exist, through the use of internal and external networks, partnerships and alliances." These partnerships are indispensable to the fulfillment of the ESS mandate.

ESS has provided aeronautical information products for the Canadian civilian and military/defence sectors for decades. As of January 2007, NAV CANADA will take the leadership role in the production, dissemination and use of these products.

The sector's public knowledge and expertise provide Canadian companies with the information and tools they need to compete internationally and to take advantage of the global opportunities available in an increasingly technology-driven economy. Canadian geomatics and geoscience industries produce high-quality products and services that are in demand throughout the world. ESS provides leadership by working with Canadian companies to identify global business opportunities and leading NRCan-sponsored trade missions to targeted countries. The new ESS international strategy will focus the sector on three key areas: international scientific collaboration; promotion of trade and investment; and transfer of Canadian knowledge and capacity to key developing countries and emerging economies.

Linkages to Canadian universities have always been an important aspect of ESS research and development programs. These linkages optimize the use of resources to meet national needs for knowledge and expertise in the earth sciences, and to develop a sufficient supply of graduates in disciplines of interest to ESS and the Canadian earth sciences community. One example is the co-located government-industry-university partnership between the Geological Survey of Canada in Quebec and the Institut national de la recherche scientifique, whose work contributes to issues related to groundwater, climate change, and mineral and energy resources. ESS also supports its relationship with academia through in-kind contributions, such as the 80 ESS research scientists presently working as adjunct professors, and the sharing of laboratory equipment, data and knowledge. As well, the Geomatics Canada Scholarship Program, which is funded by the sector and administered by the Canadian Institute of Geomatics, promotes the study of geomatics in order to further the education and training of students in this field.

The Cooperative Geological Mapping Strategies (CGMS) activity is a prime example of the sector's commitment to the co-delivery of innovative S&T. CGMS is a proposal for a stronger federal, provincial and territorial partnership to upgrade the geoscience knowledge base and to position

Canada as a pre-eminent global destination for exploration investment and for responsible energy and mineral resource development. This proposal is founded on the principles of the Intergovernmental Geoscience Accord, which documents the federal, provincial and territorial roles in public-good geoscience. This accord is vital to securing the best resources-whether they exist in universities, industry, or the provincial, territorial or federal governments—in an effort to attract investment in Canadian resources and to ensure the responsible development of Canada's natural resources.

ESS plays an active role in many horizontal files, including federal policies related to water and adaptation to climate change. The Climate Change Impacts and Adaptation Program supports projects that will improve knowledge of Canada's vulnerability to climate change and will provide the foundation upon which appropriate, responsible decisions can be made. The program will continue to provide expert advice and leadership to contribute to international and domestic policy processes related to climate change adaptation.

The sector is also involved in and supports a number of other horizontal initiatives. For example, a new framework and coordination mechanism for collaboration and delivery of geomatics at the federal level is currently being established through Canada's primary federal geomatics body, the Inter-Agency Committee on Geomatics (IACG). At the national level, ESS actively participates in the Canadian Council on Geomatics (CCOG), which brings together federal, provincial and territorial representatives to build partnerships and to share information, data and related activities. In addition, senior officials from provincial, territorial and federal agencies meet regularly to determine ways to raise the profile of geomatics and to involve senior decision-makers in planning the co-delivery of public-good geomatics information to Canadians. ESS also provides the secretariat that supports the Geographical Names Board of Canada.

ESS produces public goods that consist of data, information and knowledge, all of which the sector must carefully manage, maintain and, where appropriate, archive. To that end, the sector has assigned accountabilities for data management and dissemination to its Data Management and Dissemination Branch. This branch, along with the sector's policy and administrative support services, helps ESS remain a high-performance organization responsive to government needs.

ESS programs and services could not be developed and delivered without a workforce that continually demonstrates dedication and leadership, and is committed to working closely with other levels of government, academia, industry and stakeholders. The process of change has not been easy, but it is essential and has been rewarding.

In 2006, in order to assess how ESS was doing and to reflect on the future, the sector commissioned an external, independent evaluation of its progress to date and to identify remaining challenges. The report concludes, "Progress has been commendable in virtually every issue area that was identified at the beginning of the renewal process. The transformation process has succeeded in focusing the sector's work much more sharply on issues that are important to the federal government and Canadians." It also notes that a strong positive shift has taken place within the sector's culture and mindset, as well as improved linkages with external stakeholders.

Over the three years of the ESS 2006-2009 business planning period, and beyond, the sector will strive to remain a leader and valued partner in the development, implementation and delivery of programs and services that provide Canadians with the information they need to address their environmental, social and economic priorities.

**FIGURE 1. ALLOCATION OF ESS 2006/2007 FUNDING BY DELIVERY VEHICLES**

($ MILLION)

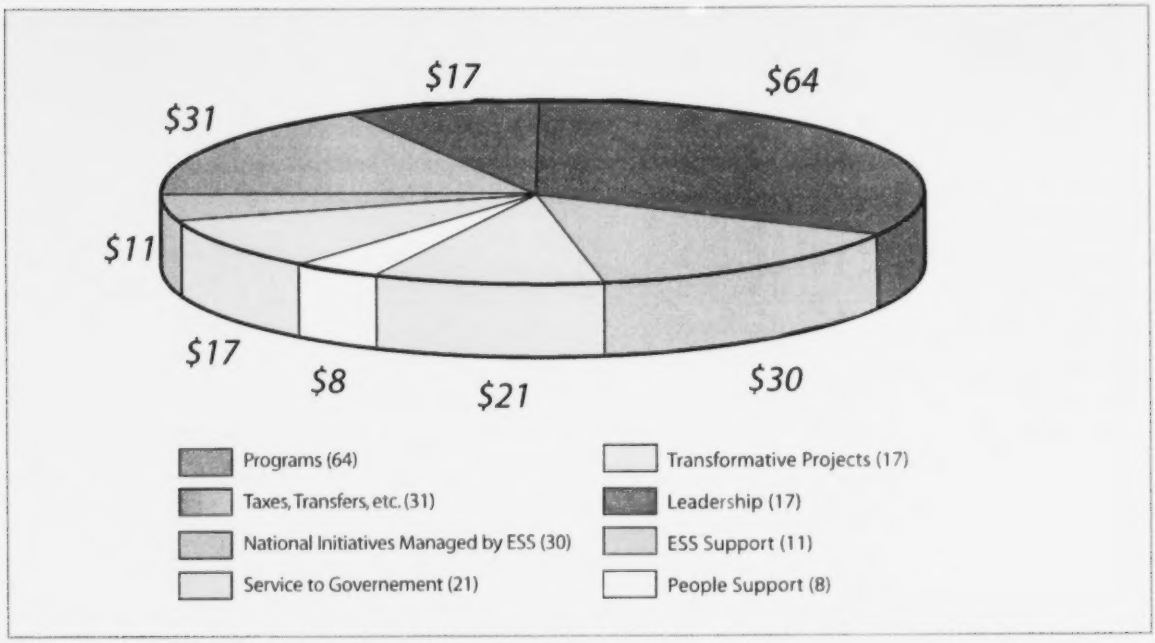
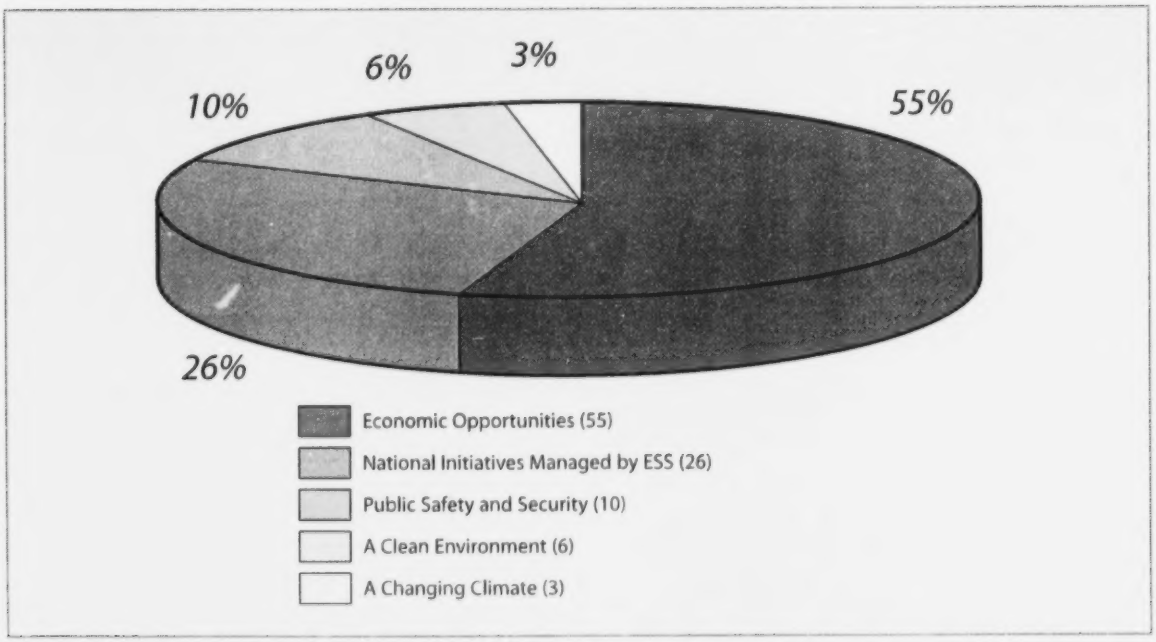



**FIGURE 2. ALLOCATION OF ESS 2006/2007 FUNDING BY ISSUE AND ESS-MANAGED NATIONAL INITIATIVES** (%)



# 3. Sectoral Issues, Outputs and Outcomes

The ESS portfolio comprises six types of delivery vehicles, each with assigned objectives for a key accountability: **programs, services to government, transformative projects, national initiatives, leadership and people support.**

Under this portfolio, ESS has allocated the largest share of resources to enhancing **economic opportunities** for Canadians. This will be done through the following means:

- acquiring information and knowledge on which to base resource assessments that inform public policy decisions on Canadian resource management and reduce investment risk for the private sector in developing base metal and conventional and non-conventional energy resources;
- facilitating responsible development of Canada's offshore and northern resources through the provision of public geoscience information specifically aimed at informing land use and seafloor use, as well as resource management decisions;
- protecting the property rights interests of the Crown by establishing and maintaining a legal survey framework on Canada, Aboriginal and Heritage Lands through the Surveyor General for Canada;
- making freely available the foundation geographic data on which location-based, value-added businesses are built; and
- providing, at no cost, the Canadian component of the global spatial reference frame, the essential geographic element that underpins secure land tenure as a basis for any development investment.

Contributions to the public policy objective of a **clean environment** include the following:

- mapping nationally significant aquifers to help federal, provincial and municipal governments protect these geological reservoirs, which are the potable water source for one third of Canadians;
- providing relevant earth sciences data to assess environmental health and the effects of disturbances, both human induced and natural, particularly where they might pose risks to human health and society; and
- providing expert geoscience advice in support of the federal environmental assessment review of development projects.

Contributions to the knowledge of our **changing climate** include the following:

- providing earth sciences information to identify and promote adaptation options for the benefit of Canadian citizens and to make Canada's infrastructure resilient to the impacts of a changing climate.

Contributions to **public safety and security** include the following:

- providing information needed by citizens and requested by front-line responders in the event of a civil emergency to meet the sector's emergency preparedness obligations;
- performing natural hazard studies (such as studies of earthquakes and landslides) that are focused on those areas where mitigation options are deemed most effective in reducing the overall risks to Canadians; and
- discharging Canada's treaty obligations to maintain the international border with the United States.

The ESS S&T portfolio also includes a set of **national initiatives** that the sector manages on behalf of the government. These include the following:

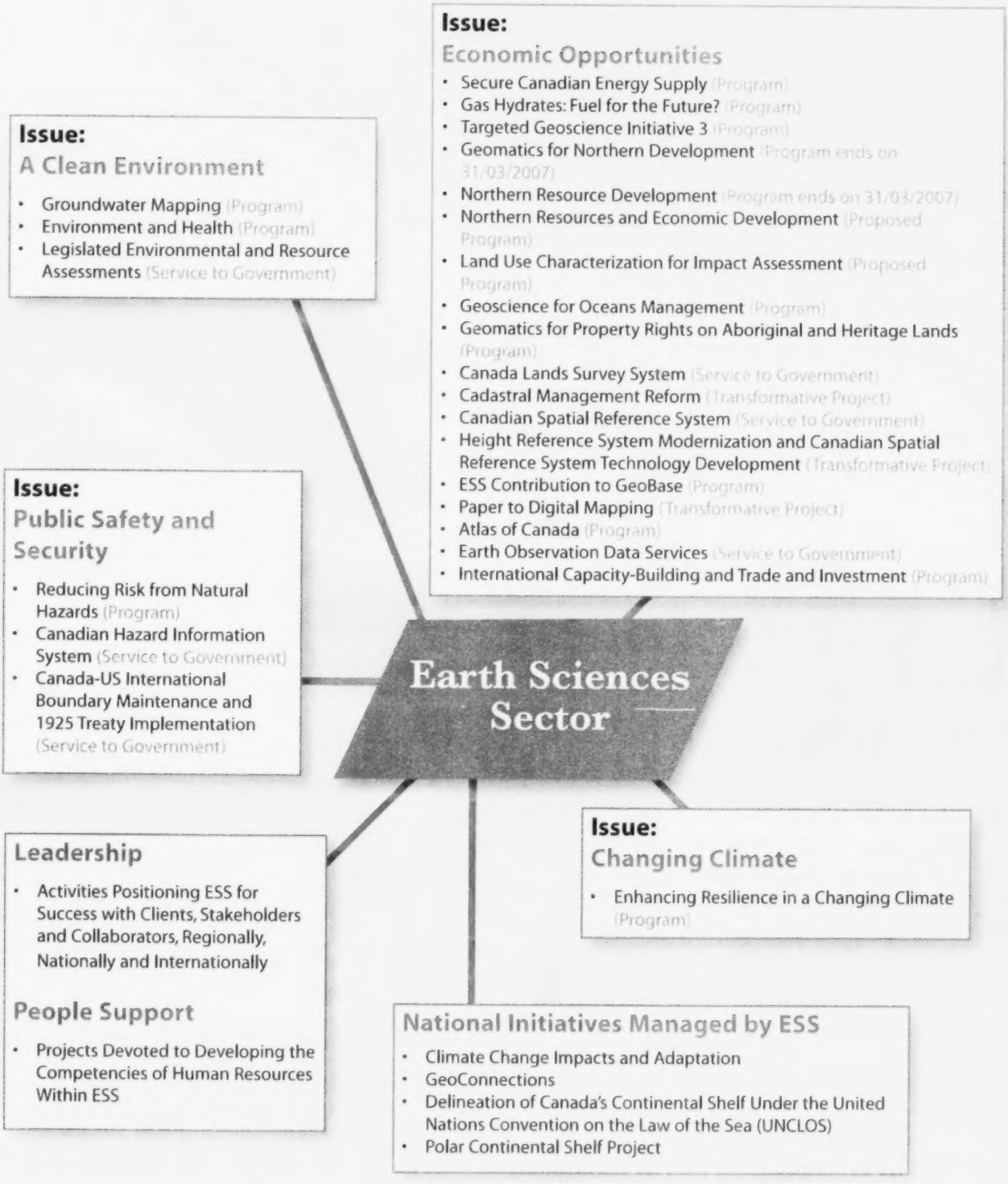
- building Canada's legal claim to additional offshore territory under the United Nations Convention on the Law of the Sea (UNCLOS);
- building a foundation to help Canadians adapt to a changing climate through the Climate Change Impacts and Adaptation Program;
- facilitating spatial information interchange and use throughout all levels of government and with industry through GeoConnections; and
- supporting research in Canada's North by providing logistical support through the Polar Continental Shelf Project.

Finally, to serve Canadians with a strong S&T-oriented network for earth sciences, both nationally and internationally, the sector has allocated funding to maintain the **leadership** and **people support** skills that ESS and NRCan need for success, as well as to maintain the real property necessary to operate offices across Canada.

The remainder of this business plan describes ESS activities that address each issue in turn; outlines the public policy questions that Canadians ask and that each activity is answering; and provides information regarding ESS outputs and outcomes over the three-year planning period.

More information on ESS activities can be found at http://ess.nrcan.gc.ca/index_e.php

*FIGURE 3. EARTH SCIENCES SECTOR ISSUES AND DELIVERY VEHICLES*


Issue:
Economic Opportunities
• Secure Canadian Energy Supply (Program)
• Gas Hydrates: Fuel for the Future? (Program)
• Targeted Geoscience Initiative 3 (Program)
• Geomatics for Northern Development (Program ends on 31/03/2007)
• Northern Resource Development (Program ends on 31/03/2007)
• Northern Resources and Economic Development (Proposed Program)
• Land Use Characterization for Impact Assessment (Proposed Program)
• Geoscience for Oceans Management (Program)
• Geomatics for Property Rights on Aboriginal and Heritage Lands (Program)
• Canada Lands Survey System (Service to Government)
• Cadastral Management Reform (Transformative Project)
• Canadian Spatial Reference System (Service to Government)
• Height Reference System Modernization and Canadian Spatial Reference System Technology Development (Transformative Project)
• ESS Contribution to GeoBase (Program)
• Paper to Digital Mapping (Transformative Project)
• Atlas of Canada (Program)
• Earth Observation Data Services (Service to Government)
• International Capacity-Building and Trade and Investment (Program)
Issue:
A Clean Environment
• Groundwater Mapping (Program)
• Environment and Health (Program)
• Legislated Environmental and Resource Assessments (Service to Government)
Issue:
Public Safety and Security
• Reducing Risk from Natural Hazards (Program)
• Canadian Hazard Information System (Service to Government)
• Canada-US International Boundary Maintenance and 1925 Treaty Implementation (Service to Government)
Earth Sciences Sector
Issue:
Changing Climate
• Enhancing Resilience in a Changing Climate (Program)
Leadership
• Activities Positioning ESS for Success with Clients, Stakeholders and Collaborators, Regionally, Nationally and Internationally
People Support
• Projects Devoted to Developing the Competencies of Human Resources Within ESS
National Initiatives Managed by ESS
• Climate Change Impacts and Adaptation
• GeoConnections
• Delineation of Canada's Continental Shelf Under the United Nations Convention on the Law of the Sea (UNCLOS)
• Polar Continental Shelf Project

## 3.1 Issue: Economic Opportunities

## Secure Canadian Energy Supply

Program

A KEY QUESTION CANADIANS ASK:
**DOES CANADA HAVE A SECURE ENERGY SUPPLY?**

The Canadian demand for energy is growing rapidly. This program will help to ensure a more secure Canadian energy supply by providing geoscience information that reduces the risks related to finding new energy resources, informs resource management and environmental protection decisions, and contributes to energy policy formulation. The program is based on basin resource assessments of conventional and unconventional resources, and uranium. It also includes studies on the effect of energy production on groundwater, and uses Northern Energy Development funding to conduct geoscience studies in the Mackenzie Valley to better understand the potential impacts of infrastructure development.

Budget: Year One: **$12.0 million**

### Outputs

- Acquisition and compilation of earth sciences information pertinent to the assessment of Mackenzie Valley pipeline construction projects.
- Assessment of the hydrocarbon potential of the Mackenzie Valley using qualitative and quantitative geoscience data.
- Estimates of cumulative Canadian energy resources using qualitative and quantitative geoscience data.
- Seven holistic evaluations of energy basins across Canada and offshore, especially in relation to conceptual plays, frontiers, uranium and the North.
- Resource evaluations, methodologies and experience transferred to provincial and territorial partners.
- Evaluations of groundwater quality and quantity, with analysis of the potential impacts of resource development.
- Evaluations of new types of unconventional energy plays, in addition to one general assessment of several types and a second detailed assessment of shale gas.

### Long-Term Outcomes

- Risks related to exploration and development are reduced.
- Enhanced geoscience information attracts new investment.

## Gas Hydrates: Fuel for the Future?

Program

A KEY QUESTION CANADIANS ASK:
**WILL GAS HYDRATES PLAY A SIGNIFICANT ROLE IN CANADA'S ENERGY SUPPLY?**

Within Canada there is increasing difficulty, and therefore increasing costs, in replacing non-renewable hydrocarbon-based energy reserves. As a key contribution to the government's priority of ensuring that Canadians have access to a secure and reliable energy supply, the Gas Hydrates program will explore the possibility of extracting methane locked in widespread gas hydrates deposits. Initially, this will be done through partnered experiments, including the recently signed partnership agreement with the Japan Oil, Gas and Metals National Corporation to study exploration wells drilled into gas hydrates at the Mallik site, located in the Mackenzie Delta. However, establishing gas hydrates as a resource and realizing gas hydrate production will require continuing experimentation, including one or more prolonged production tests.

Budget: Year One: **$2.6 million**

### Outputs

- Scenario gas hydrate potential resource estimates by geological province and through time.
- Documentation of distribution and occurrence of gas hydrates in different geological settings, such as the Arctic and the offshore, including Mallik.
- Mallik long-term production test consortium.

### Long-Term Outcomes

- Gas hydrates are established as a significant part of the Canadian and global gas supply.
- Canadian industry is a global leader in the exploration and characterization of gas hydrate and hydrate-free gas deposits.
- Canadian companies economically explore, develop and produce hydrate gas in the Canadian offshore and Arctic.

## Targeted Geoscience Initiative 3

Program

A KEY QUESTION CANADIANS ASK:
**HOW CAN WE SUSTAIN CANADA'S MINERALS AND METALS RESERVES?**

The Targeted Geoscience Initiative 3 (TGI 3) program will focus on innovative geological mapping in three dimensions (3D) to stimulate further private sector investment that helps sustain the reserves of base metals in vulnerable mining communities. The principal objective of the program is to improve the 3D public geoscience knowledge of established mining districts. Mapping in 3D can reduce the geological risk inherent in exploring, developing and deepening existing mining operations to extend known reserves, and in searching for hidden deposits. In addition, the program will provide training opportunities to expand the development of highly qualified personnel available to work in the base metals exploration sector. The target mining districts include central Newfoundland, northern New Brunswick, the Abitibi region (Ontario and Quebec), the Flin Flon–Lynn Lake region (Saskatchewan and Manitoba), and southeastern British Columbia.

Budget: Year One: **$8.8 million**

### Outputs

- Extraction of new knowledge from integrated regional-scale digital compilations and databases to unify existing government, industry and academic data.
- New regional-scale geoscience maps that permit better understanding of the geological context of mineral deposit settings.
- New or improved methods and techniques to identify the potential within known districts for undiscovered buried mineral deposits.
- Fifty new students per year and 40 exploration-related theses over the program's lifetime.
- Twenty short courses based on TGI 3 results to upgrade skills of existing explorationists.

### Long-Term Outcome

- New base metal reserves are discovered, leading to sustained base metal production around established mining communities.

## Geomatics for Northern Development

Program (Extended until March 31, 2007, to deliver stakeholder priorities)

A KEY QUESTION CANADIANS ASK:
**WHAT GEOGRAPHIC INFORMATION AND NEW TECHNOLOGIES DO NORTHERN GOVERNMENTS AND COMMUNITIES NEED TO MANAGE THEIR LANDS?**

This program supports new investment and sustainable development in the North by providing reliable and consistent geospatial information and services ranging from digital topographic data to global positioning system (GPS) online correction services. The program also provides technical expertise in geomatics, including the organization of geomatics workshops with stakeholders that will help to ensure northerners develop increased capacity in the use of geospatial infrastructure. The final goal of the program is to provide a broadly adapted suite of geospatial information that is recognized as a critical tool for decision-making.

Budget: Year One: **$3.0 million**

### Output

- Easy access to precise, integrated and up-to-date geospatial information for the northern regions of Canada.

### Long-Term Outcome

- Land use decision-making by northern communities, key northern organizations and governments regarding natural resource development and environmental management is informed by geospatial information.

## Northern Resource Development

Program (Extended until March 31, 2007, to deliver stakeholder priorities)

A KEY QUESTION CANADIANS ASK:
**HOW CAN NORTHERN CANADA BECOME MORE ECONOMICALLY SELF-SUFFICIENT AND SOCIALLY STABLE?**

Responsible development of mineral and energy resources will be a principal driver of future economic opportunities for northern Canadians. In the final year of this program, ESS will finalize and deliver an expanded geoscience knowledge base to stimulate new private sector investment in mineral and energy exploration and development. In addition, the program will support northern capacity-building by fostering a better understanding of geoscience for decision-making and by stimulating employment opportunities in exploration programs.

Budget: Year One: **$3.3 million**

### Output

- Regional digital geoscience map compilations, integrating field-based geological, geophysical and remotely sensed data, for high priority areas of the North.

### Long-Term Outcome

- Exploration for, and development of mineral and energy resources in northern Canada increases as a result of an enhanced geoscience knowledge base.

## Northern Resources and Economic Development

Proposed Program

A KEY QUESTION CANADIANS ASK:
**HOW CAN NORTHERN CANADA BECOME MORE ECONOMICALLY SELF-SUFFICIENT AND SOCIALLY STABLE?**

Canada's North has tremendous mineral potential, and these resources are anticipated to be a strong driver of improved economic opportunities that will benefit northerners and all Canadians. ESS is currently developing a co-planned and jointly delivered program with the three territorial governments. The intent is to improve, in a targeted fashion, the geoscience knowledge that will attract international investment aimed at exploring for, and eventually developing, these northern resources. Projects will be based on priorities established through a comprehensive evaluation of the mineral potential of the North.

Fiscal year 2006–2007 funding is being used to develop this program, which is tentatively scheduled to start in 2007–2008.

Budget: Year One: **$1.7 million**

### Outputs

- Compilations of geoscience data and new data interrogation techniques.
- Improved methodologies and models for quantitatively assessing the North's mineral wealth.
- New geoscience and geospatial data for priority areas of resource exploration.
- Regional earth-sciences baseline data to support an environmental impact assessment of resource development.

### Long-Term Outcome

- To be developed in consultation with federal, provincial and territorial collaborators.

## Land Use Characterization for Impact Assessment

Proposed Program

A KEY QUESTION CANADIANS ASK:

**HOW HAVE CANADA'S LAND COVER AND LAND USE PATTERNS CHANGED OVER TIME, AND HOW CAN WE BEST UNDERSTAND AND MONITOR THESE CHANGES?**

The Land Use Characterization for Impact Assessment (LUCIA) program is being developed in support of the community of earth observation (EO) users primarily, but not exclusively, within the Government of Canada. ESS has the mandate and capacity to add value and reduce obstacles related to the efficient use of EO data and derived products, in order to rationalize the federal investment in EO and to support the user community in the delivery of their mandate. Because it is a demand-driven program, leveraging from partners will help to ensure that LUCIA remains strategic and purposeful.

Working in close collaboration with its partners, mainly government departments, the sector will be proactive and provide technical support and leadership with respect to technology evolution, in order to ensure secure access to quality EO data. The LUCIA program aims to develop the necessary methods and tools to translate baseline data into information, as well as tools for monitoring and supporting decision and policy-making, while reducing costs and risks, and improving processes. The focus of LUCIA is on measuring land use changes to assess their impact on the environment and natural resources for efficient management and planning.

Budget: Year One: **$1.4 million**

### Outputs

- Interdepartmental committees and workshops involving users in planning and identifying gaps.
- Partnership agreements.
- A Canadian network of EO systems and archived data.
- Information extraction methodologies.
- Calibration, validation, georeferencing and quality assessment standards.

### Long-Term Outcome

- Land use impact on natural resources and the environment is assessed for efficient management and planning.

## Geoscience for Oceans Management
Program

A KEY QUESTION CANADIANS ASK:
**ARE WE MANAGING CANADA'S OCEAN RESOURCES RESPONSIBLY?**

The goal of this program is to contribute to geoscience knowledge for informed decision-making regarding Canada's offshore lands, so that decisions on resource development and land use (including decisions related to building offshore structures and managing related risks) are balanced with social, economic and environmental considerations. This program is based on a systematic approach to seafloor mapping to deliver geoscience knowledge for integrated ocean management. In addition to being part of the *Canada Oceans Act* and *Canada's Ocean Strategy*, this program will also provide the seabed mapping foundation for the Government of Canada's Ocean Action Plan (OAP).

Budget: Year One: **$9.6 million**

### Outputs

- Compilation and analysis of hazard distribution frequency and failure mechanisms.
- Models of the location and movement of anthropogenic materials and their effect on marine environmental quality.
- A quality-assured, online database for high-priority areas (as defined under the OAP).
- Maps and models predicting the distribution of plants and animals on the seafloor.
- New tools and improved scientific methods and technologies.
- New maps of the bathymetry, geology and benthic habitat of Canada's offshore lands.
- Regional synthesis of the geological framework for priority areas.

### Long-Term Outcome

- Canada's economy benefits from strong offshore resource development within a sustainable ocean management framework.

## Geomatics for Property Rights on Aboriginal and Heritage Lands Program

A KEY QUESTION CANADIANS ASK:
**WHO CONDUCTS THE SURVEYS THAT ESTABLISH THE PROPERTY RIGHTS ON ABORIGINAL LANDS AND IN NATIONAL PARKS?**

This program addresses the obligations of the Government of Canada related to defining property boundaries on Aboriginal Lands, including land claims, using effective and culturally aligned administration systems. In addition, the program ensures that the exterior boundaries of national parks are properly defined and that surveys required for land use decisions in communities situated on Canada Lands are effectively managed. Ensuring that boundaries are well defined eliminates property rights uncertainties and encourages sustainable economic and social development on Canada Lands.

Budget: Year One: **$6.7 million**

### Outputs

- Plans and documents prepared to Canada Land Survey System standards.
- Legal descriptions.
- Creation and update of specialized client products.
- Interdepartmental letters of agreement.
- Demarcation of cadastral boundaries on the ground.

### Long-Term Outcome

- Secure land tenure on Aboriginal and Heritage Lands and certainty of property boundaries enable a vibrant land-based economy.

## Canada Lands Survey System

Service to Government

A KEY QUESTION CANADIANS ASK:
**ARE PROPERTY RIGHTS ON CANADA LANDS PROTECTED?**

The Canada Lands Survey System (CLSS) provides the foundation for development activities on Canada Lands. Canada Lands include First Nations Lands, national parks, Canada's ocean space and the North. The CLSS also supports various property rights regimes, such as surface rights under the Indian Act or Aboriginal land-claim agreements, mineral rights for exploration and development, as well as other resource and community development. In addition, the CLSS provides the framework for the definition and description of the extent of settlement lands through the Aboriginal land-claim process.

Budget: Year One: **$4.9 million**

### Outputs

- A public repository of Canada Land Survey System records.
- Regulation of the Canada Land Surveyor profession.
- Professional boundary opinions on Canada Lands.
- Survey instructions and cadastral information infrastructure.
- Boundary assessment, regulatory regime and periodic benchmarking.

### Long-Term Outcomes

- Secure land tenure on Canada Lands and federal open space prevents boundary uncertainties from impeding economic development of communities and natural resources.
- Land administration systems support Aboriginal and northern communities, national parks and federal ocean space to meet constituents' needs.

## Cadastral Management Reform

Transformative Project – For the Canada Lands Survey System

A KEY QUESTION CANADIANS ASK:

**WHAT IS BEING DONE TO IMPROVE LAND SURVEY SYSTEMS TO SUPPORT DEVELOPMENT FOR FIRST NATIONS AND THE NORTH?**

A cadastre is a public record legal survey of the value, extent and ownership of land for taxation or administrative purposes. This project will deliver a new cadastral management framework that is fully integrated with other property rights systems on Canada Lands. The new integrated framework will effectively support responsible development of natural resources in the North and assist with First Nations self-reliance. It will also contribute to institutional initiatives for cadastral reform in developing communities nationally and internationally, and to the management of Canada's oceans.

Budget: Year One: **$2.0 million**

### Outputs

- A modernized property rights infrastructure on Canada Lands through transformative improvements to the infrastructure, via the integration of the Canada Lands Survey System with other property and land information infrastructures, and the implementation of cadastral reform initiatives.
- Key federal administrative boundary datasets that are compliant with the Canadian Geospatial Data Infrastructure.
- Federal electoral district boundary descriptions.

### Long-Term Outcomes

- Secure land tenure on Canada Lands, including Canada's offshore area, and certainty in property boundaries enable a vibrant land-based economy.
- Multi-purpose, online cadastral systems are the foundation for land information management and land administration in government.

## Canadian Spatial Reference System

Service to Government

A KEY QUESTION CANADIANS ASK:
**HOW DO I KNOW WHERE THE BOUNDARIES OF MY PROPERTY ARE?**

The Canadian Spatial Reference System (CSRS) provides fundamental reference values for latitude, longitude, height and gravity, including the orientation and rotation rate of the Earth in space. The resulting reference frames serve as standards that ensure the accuracy and compatibility of all positioning and navigation information in Canada, regardless of its source or date. This service forms the basis for provincial and municipal spatial reference networks and other government services. As geological forces constantly cause the surface of the earth to move, monitored changes in the reference frames contribute to a better understanding of Earth processes linked to global changes and geohazards. Downstream applications include many professional, economic and scientific activities, including cadastral surveys, navigation, mapping, resource management, mineral exploration, major engineering projects, geodynamic studies and other georeferencing activities. The sector's Very Long Base Interferometry Program will be discontinued by the end of fiscal year 2006–2007.

Budget: Year One: **$3.6 million**

### Outputs

- Updated coordinates (latitude, longitude, height and gravity) for reference frame monuments or observations across the country derived from cyclical or continuous measurements and collaboration with international geodetic services.
- Web-accessible geodetic information and tools enabling georeferencing consistent with national and international reference frames (NAD27, NAD83, ITRF, CGVD28 and CGSN).
- The GPS Correction Service, which supports sub-metre real-time georeferencing with respect to the national reference frame (NAD83).

### Long-Term Outcome

- Georeferenced data from different sources or dates can be used together and integrated coherently through a common, globally consistent, national coordinate reference system.

## Height Reference System Modernization and Canadian Spatial Reference System Technology Development

Transformative Project – For the Canadian Spatial Reference System

A KEY QUESTION CANADIANS ASK:
**HOW CAN NEW TECHNOLOGY GIVE US BETTER SPATIAL REFERENCE INFORMATION AT A LOWER COST?**

The goal of this project is to ensure the transition from a levelling-base height reference system delivered by a network of monuments throughout Canada to a modernized, gravity-based system. A modernized height reference system enables punctual determination of mean sea level heights anywhere in the country using modern space positioning geodetic techniques, such as GPS and the emerging Global Navigation Satellite System (GNSS). This change will improve operational efficiencies for Canadian Spatial Reference System (CSRS) users while reducing the cost of maintaining the national reference system.

Budget: Year One: **$1.3 million**

### Outputs

- An updated gravity-based geoid model with accuracy of a few centimetres.
- Strategic plan for the implementation of the new height reference system.
- Formal communications to provincial partners and stakeholders.
- Updated 3D coordinates and velocity for the Canadian Baseline Network.
- Targeted gravity and levelling surveys in critical areas.
- Integration of new developments, including updated products incorporating the latest space geodetic technologies and integrated services for reference frame access.
- Transformation parameters between height reference surfaces.

### Long-Term Outcomes

- A gravity-based height reference system is adopted, enabling measurement of heights with respect to mean sea level anywhere in the country, using GPS and emerging GNSS technologies.
- Activities related to the maintenance and continuous improvement of the modernized height reference system, including geoid modelling and targeted surveys, are transferred to the CSRS service.

# ESS Contribution to GeoBase
Program

A KEY QUESTION CANADIANS ASK:
**HOW DO CANADIANS BENEFIT BY HAVING ACCESS TO QUALITY GEOSPATIAL BASE INFORMATION COVERING ALL OF CANADA, AT NO COST TO USERS?**

GeoBase is a federal, provincial and territorial government initiative that is overseen by the Canadian Council on Geomatics (CCOG). Under this initiative, federal, provincial, territorial and municipal government data stakeholders agreed to cooperate and work collectively to ensure the provision of, and access to, a common, up-to-date and well-maintained base of quality geospatial framework data covering the entire Canadian landmass. The underlying principles of GeoBase are to provide access to quality (current, accurate, consistent and maintained) and unique (one set of data, collected and maintained by the responsible agency) geospatial data at no cost to users and with no restrictions for users.

Budget: Year One: **$4.7 million**

## Outputs

- Contribution to six data layers and standards, implemented and maintained as the fundamental national core of geospatial information.
- A communications and outreach strategy to improve awareness, and efficient and effective use, of GeoBase's products and services.
- A geospatial database environment for efficient provision of information through the GeoBase portal.
- Contribution of two additional strategic data layers, implemented within the GeoBase initiative.
- Provision of expertise and technical support to partners, for the integration of additional data layers.

## Long-Term Outcomes

- Policies, plans, regulatory decisions and investments regarding national, regional and local development reflect efficient, effective and timely use of geospatial information.
- Economic activity increases due to innovation and knowledge creation in business lines delivering geomatics-related products and services.

## Paper to Digital Mapping

Transformative Project – For National Topographic Series Maps

A KEY QUESTION CANADIANS ASK:
**WHERE CAN I GET SEAMLESS TOPOGRAPHIC INFORMATION IN A DIGITAL FORM?**

Since 1968, ESS has pursued the goal of national map coverage for Canada with the paper-based National Topographic Series (NTS) of maps and the subsequent National Digital Topographic Database (NTDB). However, the data need to be updated and reformatted before they can be incorporated into a geographical information system. This project will provide a common vision to ensure that quality geospatial information is available to serve the needs of Canadians in a Web-based environment.

Budget: Year One: **$5.1 million**

### Outputs

- Accessible raster NTS map files.
- Archived, accessible images.
- NTDB data in open standards format (CanVec).
- A user interface that supports production of a standard map.
- Print-on-demand capability that supports ESS emergency response and other government departments' paper products obligation.
- A Web service, NTS Online, that makes digital/raster copies of the NTS sheets available to the public.
- A Web service, NAPL Online, that makes the holdings of the National Air Photo Library accessible to the public in digital/raster form.
- Linking of Geo Database features to their names to allow automated text placement.
- Consistent geometry for Geo Database layers and datasets converted to open standards for Web services (CanVec).
- A Web service, Map Generator Tool, that renders CanVec in the form of a conventional map.

### Long-Term Outcome

- ESS becomes the provider of geospatial solutions to government through digital geospatial datasets that are built to open standards and that will meet the current and future needs of Canadians.

## Atlas of Canada
Program

A KEY QUESTION CANADIANS ASK:
**HOW CAN I EASILY FIND COMPREHENSIVE INFORMATION ABOUT CANADA'S LANDMASS?**

For 100 years, the Atlas of Canada has provided credible, relevant and accessible information about Canada in a geographic context and at a national level. The Atlas of Canada facilitates the integration and analysis of diverse data in order to increase knowledge about Canada.

Budget: Year One: **$2.2 million**

### Outputs

- Availability of the Atlas of Canada at public and educational venues across Canada, to reach a broad audience.
- Completion, in partnership, of interactive thematic maps on climate norms, mining locations, minerals in the environment and forest fires.
- Completion of the Canadian Watershed Map, in partnership with the Canadian Wildlife Federation and Environment Canada, for distribution to Canadian schools.
- Completion of the Protected Area Boundaries map, in partnership with the federal-provincial Canadian Council of Ecological Areas, that is included in the *National Report on Protected Areas.*
- Compilation and printing of the North American Watersheds Map, in partnership with the American and Mexican atlas programs.
- Linking of natural feature names to map geometry, to support re-use by the National Air Photo Library, GeoConnections and the publication, *Canadian Geographic.*

### Long-Term Outcome

- Canadians become more knowledgeable about their country, and thereby contribute to Canadian society.

## Earth Observation Data Services
Service to Government

A KEY QUESTION CANADIANS ASK:
**WHAT IS BEING DONE TO ENSURE THE LONG-TERM AVAILABILITY OF SATELLITE EARTH OBSERVATION DATA?**

These services provide earth observation (EO) data to ESS programs, the Canadian Space Agency, other government departments and the private sector. Data are made available in an efficient and reliable manner to support near-real-time applications, such as forest fire monitoring and mapping. In addition, non-real-time applications are available for other uses, such as land use management and climate change monitoring. The Canada Centre for Remote Sensing (CCRS) ground segment infrastructure provides North American data reception coverage capability. Its ground stations receive EO data from several satellite sensors and maintain an archive dating back to 1972.

Budget: Year One: **$3.2 million**

### Outputs

- Strategy for future evolution of the Government of Canada's EO ground segment, including options for a sustainable EO ground segment business model.
- EO data acquisition planning.
- EO data reception.
- Metadata generated and delivered to GeoConnections, so that it can host the EO data archive.
- EO data production and archiving.
- Service agreements and memoranda of understanding.
- CCRS ground segment development and operations.
- Data distribution and licensing.
- Competitively tendered industry contracts for the Prince Albert and Gatineau satellite stations, for satellite acquisition, and for operations and maintenance.

### Long-Term Outcome

- Remote sensing data are reliably available to ESS programs, other government departments and stakeholders, to enable improved policy and decision-making.

## International Capacity-Building and Trade and Investment Program

A KEY QUESTION CANADIANS ASK:
**IS OUR EARTH SCIENCES KNOWLEDGE USEFUL FOR HELPING LESS-DEVELOPED COUNTRIES AND ARE OUR EARTH SCIENCES INDUSTRIES COMPETITIVE INTERNATIONALLY?**

This program provides less-developed countries with better information on their geography, environment and natural resources, and helps them make sound and responsible policies and decisions on economic and social development. The program is consistent with Canada's foreign policy objectives and uses Canadian know-how and technologies. It also helps Canadian geoscience and geomatics companies and universities gain access to foreign markets and potential new business opportunities by leveraging ESS participation in externally funded international development projects.

Budget: Year One: **$1.16 million**

### Outputs

- Collaborative activities to secure the export of expertise, services, knowledge and methodologies from the Canadian earth sciences community.
- Agreements with international funding institutions, private sector partners and other stakeholders.
- Bilateral and multilateral collaboration with developing countries to provide ESS expertise, technology transfer and other forms of capacity-building initiatives, such as training.

### Long-Term Outcome

- Canada and Canadian industry are recognized as world leaders in the earth sciences.

# 3.2 Issue: A Clean Environment

## Groundwater Mapping
Program

A KEY QUESTION CANADIANS ASK:
**HOW CAN WE MANAGE CANADA'S GROUNDWATER RESOURCES EFFECTIVELY IF WE DO NOT KNOW WHERE THEY ARE AND HOW THEY OPERATE?**

Water sustains life, and 30 percent of Canadians derive their potable water supply from groundwater. The amount of water available for human consumption in Canada is limited, and it is shrinking because of urbanization, population growth, agriculture and industry demands, climate change and contamination of water sources. This program provides government with the basic geoscience information it needs to make decisions on the integrated management of Canada's water resources. Through strong collaboration with other government departments and agencies at the federal, provincial and municipal levels, the groundwater mapping program will establish and advance the National Groundwater Inventory to create a robust information base that is a source of sound science advice for decision-makers.

Budget: Year One: **$2.8 million**

### Outputs

- Synthesis of Canada's state of groundwater knowledge.
- First-order assessment of all key national aquifers.
- Detailed assessments of three national aquifers, adding to the six existing assessments, which will bring the total percentage of key Canadian aquifers assessed to 30 percent.
- A fully functional national groundwater database.

### Long-Term Outcome

- Economic, social and environmental benefits accrue to Canadians through sustainable and productive use of groundwater resources.

## Environment and Health
Program

A KEY QUESTION CANADIANS ASK:
**CAN WE REDUCE THE RISKS TO THE ENVIRONMENT AND TO HUMAN HEALTH CAUSED BY NATURAL OR HUMAN DISTURBANCES TO THE ENVIRONMENT?**

This program will contribute earth sciences knowledge to support decisions by those groups responsible for protecting human health and the environment. The results of this program will also be used to help monitor the state of the environment under the *Canada Environmental Protection Act* and to help the federal government and other decision-makers reduce the risks caused by potentially hazardous substances. In addition, through outreach, partnerships and capacity-building, decision-makers will be able to use geoscience information to monitor and track progress toward achieving a clean and healthy environment.

Budget: Year One: **$3.3 million**

### Outputs

- Increased understanding of processes governing transport and bioavailability of elements of concern in soils and water.
- Geochemical baseline characterizations.
- Enhanced Canadian capacity to use earth sciences knowledge in environmental and health decision-making.
- Expert advice on environmental hazards.
- Environmental indicators using in situ and remote EO data.

### Long-Term Outcome

- Responsible agencies undertake risk assessments and mitigation measures informed by earth sciences information.

## Legislated Environmental and Resource Assessments

Service to Government

A KEY QUESTION CANADIANS ASK:
**HOW DO WE KNOW THAT FEDERAL GOVERNMENT DECISIONS TO APPROVE DEVELOPMENT PROJECTS AND TO ESTABLISH PROTECTED AREAS TAKE INTO CONSIDERATION EXPERT GEOSCIENCE ADVICE AND KNOWLEDGE?**

As required by the *Canadian Environmental Assessment Act* and in response to requests by federal government agencies, this program provides expert geoscience information and expertise in reviews of development projects undergoing federal environmental assessment (EA). ESS geoscience expertise contributes to ensuring that adverse environmental impacts are identified and can be minimized before projects (such as mines, hydroelectric projects, liquefied natural gas terminals and facilities, groundwater supplies, highways, pipelines, and waste disposal and recreational facilities) receive federal approval to proceed. In addition, when requested by federal government agencies responsible for specialized land use designations and consistent with federal legislation and policy, this program provides mineral and energy resource assessments (MERA) so that non-renewable resource potential is duly considered in socio-economic feasibility studies undertaken before protected areas are established. These assessments apply to onshore and offshore lands under federal jurisdiction (those in the territories and Canada Lands offshore) and to lands under consideration as national parks or national marine protected areas.

Budget: Year One: **$0.7 million**

### Outputs

**Environmental Assessments**

- Expert geoscience advice on physical environmental baseline conditions and impact assessments, with a focus on geology, hydrogeology, permafrost and geotechnical conditions, engineering geology, environmental geochemistry, and marine, coastal and fluvial processes.
- Technical memoranda, commentary and testimony on the public record, reviewing and/or contributing to all stages of the federal EA process.
- Products and tools to support provision of geoscience expertise to the federal EA process.

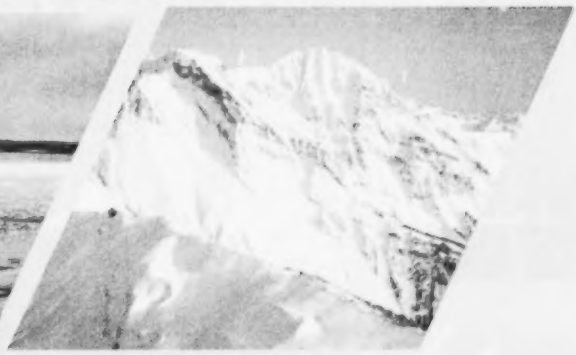
**Mineral and Energy Resource Assessments**

- Products and tools to support non-renewable resource assessments.
- Published mineral and energy resource assessments reports for proposed national parks and marine protected areas.
- Published geological datasets, particularly geochemical and geophysical datasets.
- Reports on clients and community consultations.

### Long-Term Outcome

- The environment is better protected through informed federal decisions on development and land use.

# 3.3 Issue: A Changing Climate



## Enhancing Resilience in a Changing Climate
Program

A KEY QUESTION CANADIANS ASK:
**HOW CAN WE REDUCE THE EFFECTS OF CLIMATE CHANGE ON OUR COMMUNITIES AND INFRASTRUCTURE?**

Faced with a changing climate, Canadians need to understand, prepare for and adapt to environmental, economic and societal effects on their communities, infrastructure and way of life. This program will generate and publicize earth sciences data and information aimed at improving the assessment of the sensitivity and response of Canada's landmass and coastal areas to the effects of a changing climate. The intent is to incorporate this new knowledge into planning and natural capital management. The program will target key opportunities to improve the resilience of Canadians to climate change through extensive interaction and collaboration with stakeholders.

Budget: Year One: **$3.8 million**

### Outputs

- Assessment of climate change impact on water-reliant sectors.
- Adaptation options for agriculture, oil sands production and habitat management.
- Criteria and methodology for assessment of community vulnerability.
- Documentation of vulnerabilities for community stakeholders.
- Learning and decision-making tools adapted for planning use.
- Regional assessments of landscape and ecosystem response.
- National datasets and databases on landscape change.
- Paleo-environmental reconstructions to use in impact studies, and to constrain models.
- Reports, contributions to synthesis products, and national and international assessments.

### Long-Term Outcome

- Canada's resilience to climate change is enhanced through effective adaptation strategies that are informed by ESS geoscience and geomatics outputs.

# 3.4 Issue: Public Safety and Security

## Reducing Risk from Natural Hazards
Program

A KEY QUESTION CANADIANS ASK:
**HOW CAN WE REDUCE THE RISK TO CANADIANS FROM NATURAL HAZARDS?**

This program will assess natural hazards and stimulate methods for reducing the losses resulting from the impact of these hazards on the safety and well-being of the Canadian population, economy and infrastructure. It will focus its studies on areas where risk assessments indicate that new mitigation and preparedness efforts would offer the largest potential to reduce losses due to hazards. The program's legacy will be databases, methods and tools that organizations can use to prepare for, and mitigate, natural disasters. This work will be conducted in close cooperation with communities and partner groups to ensure that outputs are both useable and targeted.

Budget: Year One: **$4.0 million**

### Outputs

- Published reports on hazard processes, conditions for occurrence, consequences and predictability.
- Published reports on hazard predictability.
- Hazard inventories.
- Accepted hazard assessments.
- Reports of methodologies for assessing vulnerability.
- Papers defining methodology for risk assessment and risk reduction estimation.
- Prioritized ESS hazard work plans based on estimates of their contribution to risk reduction.
- Educational and communications materials.
- A communications strategy, including media interviews and public presentations.
- An assessment of the training materials needed by those who plan for, and respond to, natural hazards.

### Long-Term Outcome

- The impact of natural hazards on the safety and well-being of the Canadian population, economy and infrastructure is reduced by targeting investments that offer the best opportunities to reduce risk and to increase resilience to natural hazards.

## Canadian Hazard Information Service

Service to Government

A KEY QUESTION CANADIANS ASK:

**HOW WILL GOVERNMENT ENSURE TIMELY ACCESS TO NECESSARY HAZARD AND GEOSPATIAL INFORMATION DURING A CIVIL EMERGENCY?**

This service continuously monitors, and provides information and products related to earthquakes, tsunamis, volcanic eruptions, landslides and geomagnetic storms, as well as radiological and nuclear incidents. It does so by providing ESS remote sensing, geomatics and material support to Canadian emergency response agencies. In addition, the Canadian Hazard Information Service addresses the department's responsibilities for ongoing nuclear test monitoring, as is required under the Comprehensive Nuclear Test Ban Treaty.

Budget: Year One: **$5.1 million**

### Outputs

- Publicly accessible seismic global positioning systems and geomagnetic data archives, earthquake catalogue, and earthquake and geomagnetic information products.
- Timely and high-quality data streams for tsunami warnings.
- Defined formats for data and information.
- Timely reports of earthquakes on or near Canadian territory.
- Earthquake hazard analysis.
- Timely forecasts of geomagnetic activity.
- Publication of the Canadian Geomagnetic Reference Field in a form that allows incorporation into aeronautical charts.
- Support for Comprehensive Nuclear Test Ban Treaty verification.
- Digital or hard-copy geospatial information, produced on demand.
- Tailored geospatial products, as required.
- Robust plans and products for alerts and notification of earthquakes, tsunamis, volcanic eruptions and geomagnetic storms affecting Canada.
- Investigation of explosion events of interest.
- Maps of types and distribution of radioactive isotopes.

### Long-Term Outcome

- Geospatial hazard information products are provided to the right people, in the appropriate form, in a timely fashion.

# Canada–U.S. International Boundary Maintenance and 1925 Treaty Implementation

Service to Government

A KEY QUESTION CANADIANS ASK:
**WHO IS RESPONSIBLE FOR MAINTAINING CANADA'S BOUNDARY WITH THE UNITED STATES?**

Under the auspices of the International Boundary Commission, in partnership with the United States under treaty, this service maintains a well-defined international boundary line and vista. Boundary maintenance involves inspection, monument restoration and maintenance, resurveying and vegetation clearing. These responsibilities also include regulating activities within the vista and providing advice to government on disputed areas.

Budget: Year One: **$2.4 million**

## Outputs

- Regulation and maintenance of the international boundary line.
- Updated five-year and 15-year International Boundary Maintenance plans.
- Joint Annual Reports completed and submitted to Canada's Minister of Foreign Affairs and the U.S. Secretary of State.
- Letters of authorization for construction.
- Removal of unauthorized encroachments.
- Establishment of turning points on land.
- Completion of a communications plan.
- Establishment and deployment of buoys and range marks.
- New, up-to-date official international boundary maps.
- Conversion of datasets to NAD83.
- Mathematically adjusted datasets.
- Updated boundary monument and landowner database.

## Long-Term Outcome

- The international boundary line is well defined and visible, supporting sovereignty, public safety and effective enforcement of customs, immigration, national security and other laws in Canada and the United States, as defined by treaty.

# 3.5 National Initiatives Managed by the Sector

## Climate Change Impacts and Adaptation

National Initiative

A KEY QUESTION CANADIANS ASK:
**WHAT ARE WE DOING TO ENSURE CANADIANS CAN ADAPT TO A CHANGING CLIMATE?**

This national initiative supports the generation of improved knowledge on Canada's vulnerability to climate change. Its goal is to better assess the risks and benefits posed by a changing climate and to build a foundation upon which appropriate decisions on adaptation can be made. It supports research and related scientific activities to fill critical gaps in our knowledge of Canada's vulnerability to climate change; undertakes and supports the assessment of impacts and adaptation; enhances collaboration between stakeholders and scientists; and facilitates policy development. The knowledge generated in this activity will feed into policy through reports and the participation of decision-makers in the program elements.

Budget: Year One: **$4.6 million**

### Outputs

- Research reports and data that address knowledge gaps about climate change impacts and adaptation in Canada.
- National assessment of impacts and adaptation in Canada.

### Long-Term Outcomes

- Understanding of Canada's vulnerability to climate change, and of adaptation as a response strategy, increases.
- Capacity to undertake research related to impacts and adaptation increases.
- Collaboration between the research and stakeholder communities improves, with greater stakeholder engagement in research.

## GeoConnections

National Initiative

A KEY QUESTION CANADIANS ASK:
**HOW CAN GEOMATICS TOOLS CONTRIBUTE TO LAND USE, BUSINESS DECISIONS AND ECONOMIC GROWTH?**

GeoConnections is a national partnership program to evolve and expand the Canadian Geospatial Data Infrastructure (CGDI). The CGDI provides Canadians with on-demand access to geographic information, such as maps and satellite images, and related services and applications in support of sound decision-making.

Budget: Year One: **$13.5 million**

### Outputs

- Availability of national framework and distributed datasets through the CGDI.
- A highly available, standards-based, interconnected network of data, tools, policies and client applications that form an infrastructure.
- Stakeholder agreements resulting from a common perception of CGDI benefits, including strategies for overcoming policy and cultural barriers.

### Long-Term Outcome

- Decision-makers and stakeholders benefit from using online geospatial information to address their issues.

## Delineation of Canada's Continental Shelf Under the United Nations Convention on the Law of the Sea *(UNCLOS)*

National Initiative

A KEY QUESTION CANADIANS ASK:
**WHAT IS THE EXTENT OF CANADA'S OFFSHORE TERRITORY, AS DEFINED UNDER THE LAW OF THE SEA?**

Following the ratification of UNCLOS in 2003, funding of $69 million was announced to establish the outer limits of Canada's Arctic and Atlantic continental shelves. The ESS-led delineation initiative conducts seabed surveying and mapping in support of the development of Canada's submission for a juridical continental shelf under UNCLOS. This investment will enable Canada to submit a claim, thereby achieving greater certainty with regards to its sovereignty over the Arctic and Atlantic continental shelves beyond the customary 200-nautical-mile Exclusive Economic Zone (EEZ), and ownership of any mineral and hydrocarbon resources in those areas.

Budget: Year One: **$5.5 million**

### Outputs

- The coordinates of the 2,500-metre contour and foot of the slope.
- The coordinates of the outer limit, based on a sediment formula.
- A final set of coordinates of the outer limit for the Atlantic and Arctic margins.
- A report on legal opinion about the validity of a claim on the Pacific margin.

### Long-Term Outcome

- The Canadian outer limit in the A Atlantic oceans is internationally recognized. This limit includes an area beyond the customary 200-nau in both oceans that is the maximum allowed under UNCLOS.

## Polar Continental Shelf Project

National Initiative

A KEY QUESTION CANADIANS ASK:

**WITH ALL THE SCIENTIFIC WORK IN CANADA'S NORTH, WHO COORDINATES LOGISTICAL SUPPORT SO THAT THESE PROJECTS ARE COST EFFICIENT?**

The Polar Continental Shelf Project is a national service delivery agency that coordinates logistics support for Canadian government agencies, northern communities, and independent and university groups conducting scientific activities in Canada's Arctic. Support is also provided on a full cost-recovery basis to private sector and non-Canadian scientists.

Budget: Year One: **$6.5 million**

### Outputs

- Coordinated cost-effective and high-quality logistics support for research projects in the Canadian Arctic.
- Logistics support for research in the Canadian Arctic, provided in collaboration with northern communities and suppliers.
- Contribution to the northern economy—directly by purchasing supplies and services, and indirectly by creating jobs in northern communities.

### Long-Term Outcome

- Increased scientific knowledge of the Arctic region and its adjacent waters, contributes to current and emerging national priorities and to Canadian Arctic sovereignty.

# 4. Funding for the Earth Sciences Sector

## Earth Sciences Sector Funding Mechanisms ($ million)

| | 2006–2007 | 2007–2008 | 2008–2009 |
|---|---|---|---|
| Appropriation from Parliament | 196 | 200 | 196 |
| Vote netting | 3 | 3 | 3 |
| Revolving Fund | 14 | 4 | 4 |
| **Total** | **213** | **207** | **203** |

## Earth Sciences Sector Major Categories of Expenditure

($ million) *Does not include ESS Revolving Fund*

| | 2006–2007 | 2007–2008 | 2008–2009 |
|---|---|---|---|
| Salaries | 93 | 95 | 91 |
| Employee benefits plan | 18 | 17 | 17 |
| Operating expenses, including capital | 80 | 82 | 84 |
| Grants and contributions | 8 | 9 | 7 |
| **Total** | **199** | **203** | **199** |

# 5. Earth Sciences Sector Across Canada

# 6. Earth Sciences Sector Contact List

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**Data Management and Dissemination Branch**
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4499
Fax: (613) 944-6749

**NRCan Library (Earth Sciences)**
601 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-3919
Fax: (613) 943-8742

**Policy and Coordination Branch**
580 Booth Street, 14th Floor
Ottawa, Ontario K1A 0E4
Telephone: (613) 943-4134
Fax: (613) 996-9670

**GeoConnections Secretariat**
615 Booth Street, 6th Floor
Ottawa, Ontario K1A 0E9
Telephone: 1-877-221-6213
Fax: (613) 947-2410

**Geological Survey of Canada Atlantic and Western Canada Branch**
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 947-6233
Fax: (613) 996-6575

**Geological Survey of Canada Central and Northern Canada Branch**
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 974-6233
Fax: (613) 996-6575

**International Boundary Commission**
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 944-6369
Fax: (613) 947-1337

**International Division**
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 996-7643
Fax: (613) 995-8737

**Mapping Services Branch**
615 Booth Street, 7th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 992-1797
Fax: (613) 995-2000

**Polar Continental Shelf Project**
615 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 947-1601
Fax: (613) 947-1611

**Programs Branch**
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-7761
Fax: (613) 947-8768

**Support Services Division**
601 Booth Street, Room 406
Ottawa, Ontario K1A 0E8
Telephone: (613) 943-0856
Fax: (613) 943-0849

# 7. Earth Sciences Sector Organization Chart

*as of February 1, 2007*